

Lesson Plan
5th grade

A Cloak for the Dreamer

Materials Needed:

Cloak for the Dreamer book
Pattern Blocks
Various triangles and quadrilaterals
Pattern Block handout

By Aileen Friedman

Scholastic, 1994

Mathematical Goals for the Lesson:

The students will understand that angles on a straight line add up to 180 degrees and angles surrounding a point add up to 360 degrees. They will use that information to determine the angle measures of the different angles in pattern block pieces. As the lesson progresses, students will understand why all triangles have angles measures that add to 180 degrees and why all quadrilaterals have angle measures that add to 360 degrees.

GLCE's addressed by this lesson:

G.GS.05.04 Find unknown angles in problems involving angles on a straight line, angles surrounding a point, and vertical angles.

G.GS.05.05 Know that angles on a straight line add up to 180 degrees and angles surrounding a point add up to 360 degrees; justify informally by “surrounding a point” with angles.

G.GS.05.06 Understand why the sum of the interior angles of a triangle is 180 degrees and the sum of the interior angles of a quadrilateral is 360 degrees; and use these properties to solve problems.

Brief Description of the Lesson:

DAY ONE:

Begin by reading the story *A Cloak for the Dreamer* to the class. Along the way, ask prediction questions that get at the mathematics in the story. For example:

- Ivan chooses to sew rectangles together to make a cloak. Why do you think he chose rectangles? What other shapes might also work?
- Alex cut squares in half along the diagonal to make right triangles for his cloak. Do you think he could have used other types of triangles and still have been able to create a cloak?
- Misha sewed circles together to make his cloak. His father has an idea—what do you think his idea was? How might he “fix” Misha’s cloak?

After reading the book and discussing the different shapes the brothers used to create the cloaks, begin an exploration of whether other triangles and other quadrilaterals would also work to create a cloak with no holes or gaps. Pattern blocks allow us to explore squares, equilateral triangles, two types of rhombi, isosceles trapezoids, and regular hexagons. We can arrange these shapes around a point to determine that they all can be used to create a cloak with no holes or gaps. We can also determine the measures of the interior angles of each of these shapes

by using the fact that angles surrounding a point add to 360 degrees and angles forming a straight line add to 180 degrees--this can easily be seen by starting with the square pattern block. As time permits, have students work on determining the angle measures of the other Pattern Blocks. Share, filling in the Pattern Block handout as they work.

DAY TWO:

Finish and/or recap our work with Pattern Blocks from day one. Look at different approaches for finding the measure of the large angle on the tan Pattern Block and the small angle of the tan Pattern Block.

Once we have determined the angle measures of all of the angles on the Pattern Blocks, discuss whether we think all triangles could be used to make a cloak with no holes or gaps. So far we have seen that right isosceles triangles and equilateral triangles will work, but what about obtuse isosceles or acute isosceles or right scalene or obtuse scalene or acute scalene? Assign triangle types to small groups and have them carefully draw an example of their type of triangle (using a rule to help them). As students finish drawing their triangle, quickly make 6-9 copies of the triangle for the students to cut out and try to arrange to make a cloak with no holes or gaps. Sharing these arrangements on the document camera should allow us to be confident that we can use any triangle to create a cloak. Along the way, we can also determine that the interior angles of a triangle add to be 180 degrees by seeing that three of any triangle can be put together to make a straight angle.

If time permits, do a similar activity for quadrilaterals. From the pattern block activity, students will have seen that the sum of the interior angle measures of the square, two rhombi, and trapezoid are all 360 degrees. We can explore this further with quadrilaterals that are not so "nice." Have students create non-isosceles trapezoids or other scalene quadrilaterals and see how they can still be used to surround a point. We can also see how any quadrilateral can be subdivided into two triangles and 180 degrees plus 180 degrees is 360 degrees.

NOTE: To save time, we could have some triangles and quadrilaterals pre-drawn and copied. Or do you think there is merit in having them create the triangles and quadrilaterals themselves?

DAY THREE:

Finish and/or recap our work with triangles and quadrilaterals from day two. Be sure to emphasize how we need to use each angle of a triangle or quadrilateral exactly once as we make a straight angle or surround a point in order to determine what the sum of the interior angles of each shape is. It is also important to note that we can't determine the exact angle measure of any individual angle using this technique unless copies of a particular angle can surround a point all by itself.

Introduce the idea of vertical angles by giving students a few problems to solve involving angles surrounding a point where several angles measures are given, but

one of a pair of vertical angles is missing. Students can use their knowledge about straight angles and/or angles surrounding a point to find the missing angle measure and we can prompt them to notice that vertical angles have the same angle measure.

It would be good to have a sheet of application problems at this point for students to use their critical thinking skills and new knowledge to solve.